SEMESTER S2

MATHEMATICS FOR INFORMATION SCIENCE – 2

Course Code	**MATA201**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Elementary matrix operations	**Course Type**	Theory

Course Objectives:

1. To provide a comprehensive understanding of linear algebra focusing on fundamental concepts and applications, and to develop necessary skills to effectively utilize linear algebra in advanced studies and professional practice.

SYLLABUS

Module No.	**Syllabus Description**	**Contact Hours**
1	Linear systems of equations, Solution by Gauss elimination, Row echelon form and rank of a matrix, Fundamental theorem for linear systems - homogeneous and non-homogeneous (without proof), Eigen values and Eigen vectors of matrices, Diagonalization of matrices. **[Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4]**	9
2	Vector Spaces, Examples of vector space – R^n and $M_{m\text{xn}}$ only, Subspaces, Examples as subspaces of R^n and M_{mxn} , Linear combinationsof vectors in a vector space, Spanning sets, Linear dependence and independence, Basis for a vector space, The dimension of vector space, Coordinate representation in R^n,	9

	Change of basis in R^n : Transition Matrix (without proof). **[Text 2: Relevant topics from sections 4.2, 4.3, 4.4, 4.5, 4.7]**	
3	Vector length and unit vector, Dot product and angle between twovectors, The Cauchy- Schwarz Inequality, Inner product, Examples as R^n and M_{2x2}, Properties of inner products, Definitions of length, distance and angle, Orthogonal projections in inner product spaces, Orthogonal and orthonormal sets, Orthogonal and orthonormal basis, Gram-Schmidt orthonormalization process (without proof), The least squares problem, Projection onto a Subspace, Solving the least square problems. **[Text 2: Relevant topics from sections 5.1, 5.2, 5.3, 5.4]**	9
4	Linear Transformations, Properties of linear transformations, Linear Transformation given by a matrix, Rotation in R^2, Projection in R^3, Kernel of a Linear Transformation and its basis, Range of a Linear Transformation and its basis, Rank and Nullity of a Linear Transformation, Sum of Rank and Nullity (without proof), Matrices for Linear Transformations. **[Text 2: Relevant topics from sections 6.1, 6.2, 6.3]**	9

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Solve system of linear equations, to evaluate eigen values and eigen vectors of matrices and to diagonalize matrices.	**K3**
CO2	Understand the concepts of vector spaces and subspaces and to apply their properties.	**K3**
CO3	Describe inner product spaces and their properties, to apply orthonormalization process and to solve least square problems.	**K3**
CO4	Understand the concept of linear transformation and to apply its properties, to find the rank and nullity of a linear transformation and to find the matrices of linear transformations.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-		2	-	-	-	-	-	1
CO2	3	2	-		-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	1
CO4	3	3	-	1	2	-		-	-	-	1

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th edition, 2016
2	Elementary Linear Algebra	Ron Larson	Cengage Learning	8th edition, 2017

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal & Cheng SoonOng	Cambridge University Press	1st edition, 2020
2	Linear algebra and learning from data	Gilbert Strang	Wellesley-Cambridge Press	1st edition, 2019
3	Elementary Linear Algebra	Stephen Andrilli & David Hecker	Academic Press Inc.	4th edition, 2010
4	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11th edition, 2019

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	https://archive.nptel.ac.in/courses/111/107/111107164/
3	https://archive.nptel.ac.in/courses/111/107/111107164/
4	https://archive.nptel.ac.in/courses/111/107/111107164/